

## Bat species on Timor Island, Indonesia

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**Abstract.** *Pramatana F, Hasibuan MM, Tohir RK, Tae CE, Fathurohman F, Maryanto I, Wiantoro S, Supriatna N, Arsa IGBA, Rammang N, Marawali A. 2025. Bat species on Timor Island, Indonesia. Biodiversitas 26: 564-571.* Timor Island, East Nusa Tenggara Province, Indonesia, is one of the Lesser Sunda regions with unique biodiversity. Updating information as a database needs to be carried out to become the basis for conservation actions at the species and ecosystem levels, considering that bat species are very vulnerable to habitat destruction. This research aims to collect a checklist of bat species on Timor Island by selecting sampling locations based on the habitat's climatic conditions. The study was conducted in 10 research locations, including conservation, forest, village, and one disturbance area. Data was collected using mist nets, harp traps, and interviews with local communities. Suppose there is a record or a species that is doubtful in its identification, a specimen will be made and will then send samples to the Museum Zoologicum Bogoriense, Indonesia. Bat research in the Timor Island area was carried out in 1979 and recorded twenty-two species of bats. However, the locations in that research are spread across the Timor Leste region. This study on Timor Island, Indonesia, recorded twenty bat species, including a new record of *Dobsonia viridis* in the Lesser Sunda Island region. This species was previously documented only in Celebes and Moluccas.

**Keywords:** Conservation, *Dobsonia viridis*, Lesser Sunda Island, new record

### INTRODUCTION

Bats have an essential role in ecosystems, especially in ecological functions such as pollination (Kasso and Balakrishnan 2013; Sritongchuay et al. 2019; Tremlett et al. 2020; Gonzalez-Gutierrez et al. 2022), seed dispersal (Seltzer et al. 2013; Enríquez-Acevedo et al. 2020; Laurindo et al. 2020), and controlling insect populations (McCracken et al. 2012; Ramírez-Francel et al. 2022; Beilke and O'Keefe 2023; Tuneu-Corral et al. 2023). Globally, International Union for Conservation of Nature and Natural Resources (IUCN) (2024) recorded 1336 species of bats, of which nine species have been declared extinct, 222 (16.62%) are threatened, and 236 (17.66%) are data deficient. Based on the Bats of the World: Taxonomic and Geographic Database compiled and edited by the American Museum of Natural History, 1482 species were recorded, with 217 (14.64%) species classified as threatened and 397 (26.79%) as not evaluated and data deficient (Simmons and Cirranello 2024). The number of bat species classified as data deficient is quite large considering that bats are an order with more than a fifth (22.30%) of the mammalian species (IUCN 2024). Regarding population trend information, 53.13% of bat

species have unknown population trends, and 24.42% have decreased population (IUCN 2024). This aligns with Frick et al. (2020), who stated that half of the bat species have unknown population trends because knowledge about these species is less than that of other mammals or birds, making it quite challenging to determine conservation action plans. Frick et al. (2020) also reported major threats facing bat species, including habitat loss, hunting, and climate change.

In Indonesia, IUCN (2024) recorded 225 bats, revealing 38 (16.89%) species threatened, 33 (14.67%) species data deficient, and almost half having unknown population trends. Maryanto et al. (2019) noted that Indonesia has a higher number of species, at least 239 species of bats ( $\pm 16\%$  of the world's species) and has the highest number globally (Guinness World Records 2015). The richness of bat species needs to be supported with research, monitoring, and other conservation actions, considering that many species have unknown population trends (IUCN 2024).

Wallacea bioregions, which consists of Sulawesi, Maluku, and Nusa Tenggara, Indonesia, have a high level of endemism with unique biodiversity, which is different from the Oriental and Australasian regions because it is dominated by relatively dry (semi-arid) climatic factors (Fick and Hijmans 2017; Zepner et al. 2021; Struebig et al.

2022). As part of the Wallacea bioregion with Bali Island within it, the Lesser Sunda Islands have biodiversity with its characteristics and uniqueness, including bat species (Yuni and Yuda 2020). Maryanto et al. (2019) notes that the Lesser Sunda Islands contribute 68 species (28%) to Indonesia's total number of bat species. As many as 11 species of bats in the Lesser Sunda Islands (16.18%) were categorised as data deficient by the IUCN, so research and monitoring must be carried out continuously (Maryanto et al. 2019; IUCN 2024). In the Lesser Sunda Islands, bat species use diverse habitats, including forests, savanna, shrubland, wetlands, rocky areas, caves, and artificial/terrestrial (IUCN 2024). Thus, this species is vulnerable to threats such as residential and commercial development, agriculture, aquaculture, energy and mining production, biological resources use, human intrusions and disturbance, natural system modification, invasive and other problematic species, genes, diseases, climate change, and severe weather (IUCN 2024).

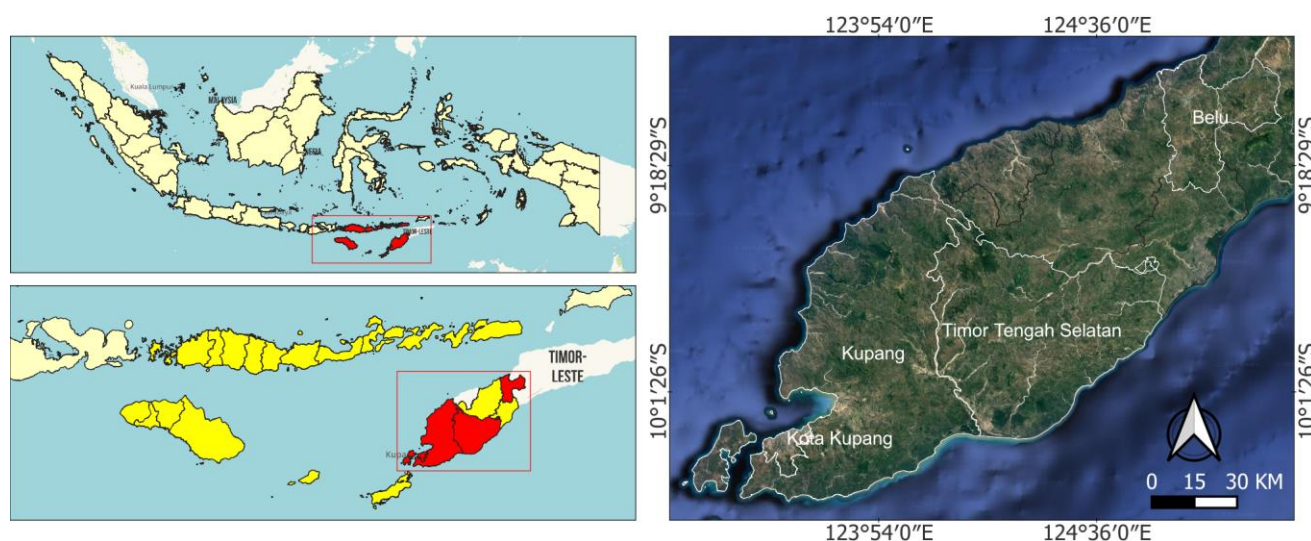
Timor Island, Indonesia, part of the Lesser Sunda Islands, has extreme climatic factors (Fick and Hijmans 2017; Zepner et al. 2021). In 1970-2000, rainfall in the driest month only reached 1-30 mm, and in the wettest month, only 217-407 mm (Fick and Hijmans 2017). In 2022, the provincial capital, Kupang City, had eight dry months, with the lowest rainfall being 2 mm, and in the wet months, the highest was only 77 mm (Zepner et al. 2021). Thus, the species on Timor Island are those that can adapt to climatic conditions and its constituent habitats, including bat species (Berg et al. 2010; Boyles et al. 2016; Lison et al. 2020; Festa et al. 2023). In 1979, Goodwin (1979) researched the diversity of bat species on Timor Island and covered approximately 21 locations in the Timor Leste region (formerly the territory of the Republic of Indonesia). Goodwin (1979) noted that as many as 22 species from six families were found in his research, including Geoffroy's Rousette (*Rousettus amplexicaudatus*), Gray Flying Fox (*Pteropus griseus*), Large Flying-fox (*Pteropus vampyrus*), Sunda Fruit Bat (*Acerodon mackloti*), Western Naked-backed Fruit Bat (*Dobsonia peronii*), Greater Shortnosed

Fruit Bat (*Cynopterus sphinx*), Dawn Bat (*Eonycteris spelaea*), Dagger-toothed Long-nosed Fruit Bat (*Macroglossus lagochilus*), Pallas's Tube-nosed Bat (*Nyctimene cephalotes*), Black-bearded Tomb-bat (*Taphozous melanopogon*), Bare-rumped Sheath-tail-bat (*Taphozous saccolaimus*) (now as *Saccolaimus saccolaimus*), Bornean Horseshoe Bat (*Rhinolophus borneensis*), Creagh's Horseshoe Bat (*Rhinolophus creaghi*), Large-eared Horseshoe Bat (*Rhinolophus philippinensis*), Bicolored Leaf-nosed Bat (*Hipposideros bicolor*), Diadem Leaf-nosed Bat (*Hipposideros diadema*), Least Pipistrelle (*Pipistrellus tenuis*), Greater Bamboo Bat (*Tylonycteris robustula*), Lesser Asiatic Yellow House Bat (*Scotophilus kuhlii*), Little Bent-winged Bat (*Miniopterus australis*), Small Long-fingered Bat (*Miniopterus pusillus*), and Large Bent-winged Bat (*Miniopterus magnater*). The research is quite old, and the location is currently outside the region of the Republic of Indonesia, so data updates for Timor Island, Indonesia's region, need to be carried out as a biodiversity monitoring and conservation action. Other research only documents certain, relatively narrow species or locations (do Hage et al. 2014; Selan et al. 2019; Blegur et al. 2020; Tangguda et al. 2022). This research aims to update the data and provide information on the checklist of bat species on Timor Island, which is in the Indonesian region.

## MATERIALS AND METHODS

### Study area

The research was carried out at ten locations in four districts of Timor Island, Indonesia, i.e.: Kupang City (Universitas Nusa Cendana), Kupang District (the Prof. Ir. Herman Johanes Grand Forest Park, Camplong, Bipolo, and Menipo Nature Tourism Parks), Timor Tengah Selatan District (Bonleu Village, Oesublele Forest Area, Kuanfatu Sub-district, and the Mutis Nature Reserve which is now the Mutis Timau National Park), and Belu District (Lidak Urban Village) (Figure 1).



**Figure 1.** Map of research locations in four districts on Timor Island, Indonesia

The selection of the study area was based on representative locations with a relatively wet climate (Timor Tengah Selatan District) (Fick and Hijmans 2017; Zepner et al. 2021), a relatively dry climate (Kupang District) (Fick and Hijmans 2017; Zepner et al. 2021), an area with disturbances (Kupang City), and the area closest to the Timor Leste boundaries (Belu District) which is the location previously study (Goodwin 1979).

### Procedures

Data was collected using mist nets, and harp traps, installed before sunset and periodically checked (every 15 minutes until midnight) before being dismantled or rendered inoperative before sunrise (Lintott et al. 2014; Trevelin et al. 2017; Appel et al. 2021; Tanshi and Kingston 2021; Aylen and Bishop 2022; Mancini et al. 2022). We used three mist nets in each location at a 3-5 m height from the ground and were placed around waterways, fruit-bearing trees, and areas predicted to be flyways. Data collection at each location was only done once (one night trap). The number of trapped bats was then counted and morphometric measurements were taken consisting of Head-to-Body Length (HBL), Tail-to-Ventral (TV), Forearm (FA), Tibia Length (TB), Ear length (E), Hind Foot (HF), Metacarpal (MCL), and Phalanges (P) length (Panyutina et al. 2015; Schmieder et al. 2015; Hedrick and Dumont 2018). Each individual was identified by matching characteristics and morphometrics using a field guide (Suyanto 2001). Bats that have been measured and identified are immediately released to minimize stress on the animals (Sikes 2016). Suppose there is a record or a species that is doubtful in its identification, a specimen will be made using chloroform first to make the bat unconscious, then injected with 90% alcohol, and will then send samples of this species to the Museum Zoologicum Bogoriense, Indonesia. Apart from collecting primary data using traps, we also collected data on bat species through interviews with local people who assisted our research at each location before and during the research (Cretois et al. 2020). The interview results will help enrich this study's information (Cretois et al. 2020; Stern and Humphries 2022).

### Data analysis

Data analysis was conducted on bat morphometric measurements, producing mean sizes for the forearm, tibia length, hind foot, ear length, head-to-body length, tail-to-ventral, and weight (Kamilah et al. 2021). These results can also describe the morphometric measurements of certain bat species, especially those found in the study area.

## RESULTS AND DISCUSSION

### Checklist of bats species

This research captured 164 individuals, 20 species, and six families (Table 1). Thirteen species of bats have been captured by (Goodwin 1979) and re-recorded in this

research. This research has expanded the documented occurrences of several species that were previously unrecorded on the island of Timor (Goodwin 1979), including *Cynopterus nusatenggara*, *Cynopterus titthaecheilus*, *Dobsonia viridis*, *Kerivoula flora*, *Myotis muricola*, *Taphozous longimanus*, and *Miniopterus shortridgei*. Meanwhile, species not captured in this study include *A. mackloti*, *N. cephalotes*, *S. saccolaimus*, *R. borneensis*, *H. bicolor*, *P. tenuis*, *T. robustula*, *M. pusillus*, and *M. magnater*. Thus, the overall list of bat species on Timor Island is recorded at 28 species consisting of 6 families. If combined with research result by Goodwin (1979), Timor Island's checklist of bat species should record as many as 29 species (Table 2). One species, *N. cephalotes*, was reported to be possibly extinct in the Timor region (Tsang 2016b).

We obtained information on findings from local communities before conducting a study regarding the *P. griseus* species that are hunted for consumption. This phenomenon is in line with a previous report (Tsang and Sheherazade 2020), which stated that this species is very vulnerable to hunting for its bushmeat in Sulawesi by local communities. *Pteropus griseus* has a distribution area in the Lesser Sunda Islands, Sulawesi, and Maluku, with a forest area as a habitat (Maryanto et al. 2019; Tsang and Sheherazade 2020). In Sulawesi, this species is seen on small islands alongside *Acerodon celebensis* and *Pteropus alecto* species in mangrove ecosystems (Sheherazade and Tsang 2018). Tsang and Sheherazade (2020) further explained that this species is also threatened by logging, which has resulted in increased erosion in Sulawesi and burning activities on agricultural land in the Timor region, causing a decline in habitat quality.

The following species with a mark in population number is *P. vampyrus*. The size of this population could not be accurately determined due to its substantial abundance, with estimates exceeding 2000 individuals in Menipo Nature Tourism Parks. *Pteropus vampyrus* faces serious threats, as some reports state that this species is rarely encountered, even in ordinarily active roosts (Struebig et al. 2007; Harrison et al. 2011). Some reports of poaching also threaten this species (Mildenstein et al. 2022). *Pteropus vampyrus* inhabits several habitats by perching in tree stands in primary and secondary forests, mangroves, small islands, or agricultural areas affluent as feeding sources (Aziz et al. 2019; Mohd-Azlan et al. 2022). In East Nusa Tenggara, this species is reported to have a protected colony in Komodo National Park, a wildlife reserve area on Timor Island, and the population is known to reach more than 5000 on an island with mangrove forests in a conservation area (Mildenstein et al. 2022). We predict that the locations is the Menipo Nature Tourism Park, which is the location of this study. This area is a separate island with a large mangrove forest ecosystem and a conservation area with *P. vampyrus* colonies in abundance.

**Table 1.** Species found at the research sites on Timor Island, Indonesia

Family	Species	Sites									
		A	B	C	D	E	F	G	H	I	J
Pteropodidae	<i>Cynopterus nusatenggara</i> (Kitchener & Maharadatunkamsi, 1991)	0	1	6	2	1	0	0	0	0	5
	<i>Cynopterus sphinx</i> (Vahl, 1797)	0	10	3	2	6	0	0	0	0	6
	<i>Cynopterus titthaecheilus</i> (Temminck, 1825)	0	2	4	1	5	0	0	0	0	0
	<i>Dobsonia peronii</i> (E.Geoffroy, 1810)	0	0	1	0	0	0	0	0	0	0
	<i>Dobsonia viridis</i> (Heude, 1896)	0	0	1	0	0	0	0	0	0	0
	<i>Pteropus griseus</i> (E.Geoffroy, 1810)	0	0	0	0	0	0	0	*	0	0
	<i>Pteropus vampyrus</i> (Linnaeus, 1758)	0	0	0	0	**	0	0	0	0	0
	<i>Rousettus amplexicaudatus</i> (E.Geoffroy, 1810)	11	2	1	11	1	0	0	0	0	6
	<i>Eonycteris spelaea</i> (Dobson, 1871)	1	0	0	0	0	0	0	0	0	0
	<i>Macroglossus minimus</i> (E.Geoffroy, 1810)	3	2	5	1	4	0	1	0	0	0
Emballonuridae	<i>Taphozous longimanus</i> (Hardwicke, 1825)	0	0	0	0	0	0	0	0	0	15
	<i>Taphozous melanopogon</i> (Temminck, 1841)	0	0	0	0	0	0	0	0	0	8
Rhinolophidae	<i>Rhinolophus creaghi</i> (Thomas, 1896)	0	0	0	0	0	1	1	0	0	2
	<i>Rhinolophus philippinensis</i> (Waterhouse, 1843)	0	0	0	0	0	1	0	0	0	1
Hipposideridae	<i>Hipposideros diadema</i> (É.Geoffroy Saint-Hilaire, 1813)	0	0	0	0	0	0	0	0	0	1
Vespertilionidae	<i>Kerivoula flora</i> (Thomas, 1914)	0	0	0	0	0	0	1	0	0	0
	<i>Myotis muricola</i> (Gray, 1846)	0	0	0	0	0	0	0	6	0	0
	<i>Scotophilus kuhlii</i> (Leach, 1821)	1	0	0	0	0	0	0	0	0	0
Miniopteridae	<i>Miniopterus australis</i> (Tomes, 1858)	0	0	0	0	0	0	0	0	1	0
	<i>Miniopterus shortridgei</i> (Laurie & Hill, 1957)	0	0	0	0	0	1	0	0	19	0
<b>Total</b>		<b>16</b>	<b>17</b>	<b>21</b>	<b>17</b>	<b>17</b>	<b>3</b>	<b>3</b>	<b>6</b>	<b>20</b>	<b>44</b>

Note: a: Universitas Nusa Cendana; b: Prof. Ir. Herman Johanes Grand Forest Park; c: Camplong Nature Tourism Parks; d: Bipolo Nature Tourism Parks; e: Menipo Nature Tourism Parks; f: Bonleu Village; g: Oesublele Forest Area; h: Kuanfatu sub-district; i: Mutis Nature Reserve (Mutis Timau National Park); j: Lidak Urban Village; \*: Species information is obtained before the survey is carried out and is hunted by the local community; \*\*: The author cannot determine the number of individuals (abundant)

**Table 2.** Checklist of bat species on Timor Island, Indonesia

Family	Species	Presence		Conservation status			PT
		Goodwin (1979)	This study (2024)	IUCN	CITES	P.106	
Pteropodidae	<i>Acerodon mackloti</i>	●		VU	II	NP	Dec
	<i>Cynopterus nusatenggara</i>	●	●	LC	NA	NP	Stb
	<i>Cynopterus sphinx</i>	●	●	LC	NA	NP	Inc
	<i>Cynopterus titthaecheilus</i>		●	LC	NA	NP	Stb
	<i>Dobsonia peronii</i>	●	●	LC	NA	NP	Stb
	<i>Dobsonia viridis</i>		●	LC	NA	NP	Stb
	<i>Pteropus griseus</i>	●	●	VU	II	NP	Dec
	<i>Pteropus vampyrus</i>		●	EN	II	NP	Dec
	<i>Rousettus amplexicaudatus</i>	●	●	LC	NA	NP	Unk
	<i>Eonycteris spelaea</i>	●	●	LC	NA	NP	Dec
	<i>Macroglossus minimus</i>	●	●	LC	NA	NP	Stb
	<i>Nyctimene cephalotes</i> *	●		LC	NA	NP	Unk
Emballonuridae	<i>Saccolaimus saccolaimus</i>	●		LC	NA	NP	Stb
	<i>Taphozous longimanus</i>		●	LC	NA	NP	Stb
	<i>Taphozous melanopogon</i>	●	●	LC	NA	NP	Stb
Rhinolophidae	<i>Rhinolophus borneensis</i>	●		LC	NA	NP	Unk
	<i>Rhinolophus creaghi</i>	●	●	LC	NA	NP	Dec
	<i>Rhinolophus philippinensis</i>	●	●	LC	NA	NP	Unk
Hipposideridae	<i>Hipposideros bicolor</i>	●		LC	NA	NP	Stb
	<i>Hipposideros diadema</i>	●	●	LC	NA	NP	Dec
Vespertilionidae	<i>Kerivoula flora</i>		●	VU	NA	NP	Dec
	<i>Myotis muricola</i>		●	LC	NA	NP	Stb
	<i>Pipistrellus tenuis</i>	●		LC	NA	NP	Stb
	<i>Scotophilus kuhlii</i>	●	●	LC	NA	NP	Stb
	<i>Tylonycteris robustula</i>	●		LC	NA	NP	Unk
Miniopteridae	<i>Miniopterus australis</i>	●	●	LC	NA	NP	Stb
	<i>Miniopterus shortridgei</i>		●	DD	NA	NP	Unk
	<i>Miniopterus pusillus</i>			LC	NA	NP	Unk
	<i>Miniopterus magnater</i>	●		LC	NA	NP	Unk

Note: ●: Presence; DD: Data Deficient; LC: Least Concern; VU: Vulnerable; EN: Endangered; NA: Non-Appendix; II: Appendix II; NP: Non-Protected; PT: Population Trend; Unk: Unknown; Dec: Decreasing; Stb: Stable; Inc: Increasing; \*: Possibly Extinct in the Timor Region, Indonesia

Within the scope of Timor Island (Indonesia and Timor Leste), four bat species are threatened, three of which are vulnerable, and one species is listed as endangered. Apart from that, one species was declared data deficient (IUCN 2024). Based on the cites, three species of bats are categorized in Appendix II, all of which belong to the Pteropodidae family (UNEP-WCMC 2024). *Acerodon mackloti*, *P. griseus*, and *P. vampyrus*, these three species from the Pteropodidae family, are reportedly often hunted for use by the local community for being consumed (Mildenstein 2016, et al. 2022; Tsang and Sheherazade 2020). The population decline is caused more by hunting compared to other threat factors (Epstein et al. 2009). The species *A. mackloti* is reported to be often found on the market for sale (Sagot and Chaverri 2015). As a colonial species, hunting not only affects death for the target individual but possibly in injury or stress to other roosting individuals (Mildenstein et al. 2022). Monitoring this

species needs to be carried out sustainability so that its colonies do not disappear, as has happened in several areas (Mildenstein 2016, et al. 2022; Tsang and Sheherazade 2020). Another species that is threatened is *K. flora*. This species' population has reportedly decreased by 30% over the last 10 years due to habitat loss in primary forests, and this decline is projected to continue (Pacifci et al. 2013; Waldien and Wiantoro 2021). Based on population trends, almost half of the species recorded on Timor Island have declining population trends (25.93%) and unknown population trends (22.22%).

### Species morphometric description and distribution

Species identification is based on Morphometric measurement and morphological observations. The size of each part shown in Table 3 is the mean of all individuals obtained. We found the *C. nusatenggara* with a forearm size of 75.1-81.8 mm.

**Table 3.** Species morphometric and distribution

Species	Common name	D	Morphological size						
			FA	TB	HF	E	HB	TV	W
Family Pteropodidae									
Genus <i>Cynopterus</i>									
<i>C. nusatenggara</i> *	Nusatenggara Short-nosed Fruit Bat	e	77.9	30.7	15.5	17.8	91.0	4.6	51.8
<i>C. sphinx</i>	Greater Shortnosed Fruit Bat	a-f	77.5	30.6	15.2	16.3	89.7	9.5	50.2
<i>C. tithaeceilus</i>	Indonesian Short-nosed Fruit Bat	b-e	81.8	32.3	15.3	16.5	98.3	10.3	56.4
Genus <i>Dobsonia</i>									
<i>D. peronii</i>	Western Naked-backed Fruit Bat	e	107.4	50.5	25.7	22.3	155.1	17.7	162
<i>D. viridis</i> *	Greenish Naked-backed Fruit Bat	f, g	99.5	42.9	23.2	24.2	133.6	17.9	112
Genus <i>Pteropus</i>									
<i>P. griseus</i>	Gray Flying Fox	e, f, g							
<i>P. vampyrus</i>	Large Flying-fox	a-e							
Genus <i>Rousettus</i>									
<i>R. amplexicaudatus</i>	Geoffroy's Rousette	a-h	78.0	33.7	14.8	17.7	100.1	14.5	60.1
Genus <i>Eonycteris</i>									
<i>E. spelaea</i>	Dawn Bat	a-g	79.7	33.6	15.9	14.8	104.2	1.9	76.2
Genus <i>Macroglossus</i>									
<i>M. minimus</i>	Dagger-toothed Long-nosed Fruit Bat	a, c-h	41.5	18.1	13.9	13.4	59.2	-	12.7
Family Emballonuridae									
Genus <i>Taphozous</i>									
<i>T. longimanus</i>	Long-winged Tomb Bat	a-e	56.8	18.9	5.4	11.6	81.7	14.8	21.8
<i>T. melanopogon</i>	Black-bearded Tomb-bat	a-f	61.5	23.1	6.6	13.9	74.7	17.6	24.9
Family Rhinolophidae									
Genus <i>Rhinolophus</i>									
<i>R. creaghi</i>	Creagh's Horseshoe Bat	a, c, d, i	47.7	22.7	6.2	17.1	52.1	17.3	12.5
<i>R. philippinensis</i>	Large-eared Horseshoe Bat	a, f-i	45.0	21.1	5.0	26.6	51.2	21.4	13.0
Family Hipposideridae									
Genus <i>Hipposideros</i>									
<i>H. diadema</i>	Diadem Leaf-nosed Bat	a-h	86.4	37.4	7.8	29.0	95.0	38.9	42.0
Family Vespertilionidae									
Genus <i>Kerivoula</i>									
<i>K. flora</i>	Flores Woolly Bat	d, e	38.4	19.2	6.2	12.2	44.4	43.6	7.0
Genus <i>Myotis</i>									
<i>M. muricola</i>	Nepalese Whiskered Bat	a-g	35.5	16.6	6.6	11.6	43.6	38.8	4.0
Genus <i>Scotophilus</i>									
<i>S. kuhlii</i>	Lesser Asiatic Yellow House Bat	a-f	51.3	16.7	7.8	12.1	64.8	35.7	16
Family Miniopteridae									
Genus <i>Miniopterus</i>									
<i>M. australis</i>	Little Bent-winged Bat	a, c-h	43.4	19.2	8.2	10.4	52.2	47.4	8.0
<i>M. shortridgei</i>	Shortridge's Long-fingered Bat	c, e	48.3	20.7	8.8	10.7	59.8	53.2	12.8

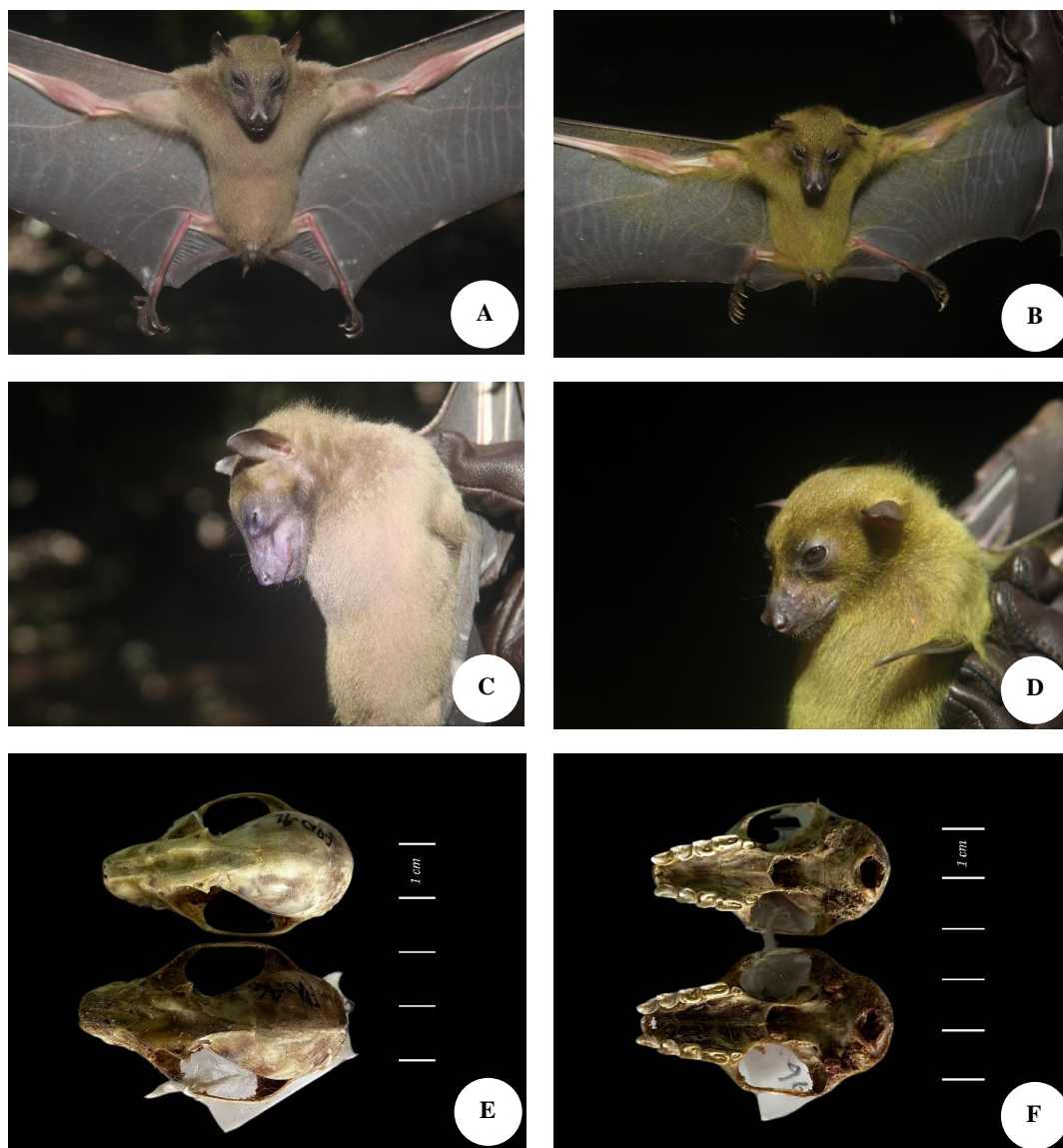
Notes: a: Borneo; b: Sumatera; c: Java; d: Bali; e: Lesser sunda; f: Celebes; g: Moluccas; h: Papua; i: Timor; FA: Forearm; TB: Tibia length; HF: Hind foot; E: Ear length; HB: Head-to-body length; TV: Tail-to-ventral; W: Weight; \*: Deposited species



The size found was more considerable than Suyanto (2001), which reported that the size of this species of the forearm was around 55-65 mm. Referring to Suyanto (2001), the forearm size we obtained is more suitable to the size of *C. titthaecellus*, and this species has a forearm size in the 74-83 mm range. However, we believe this species is *C. nusatenggara* because it has black ear edges that only belong to this species within the genus *Cynopterus*. Therefore, we deposited several samples of the larger *C. nusatenggara* species at the Museum Zoologicum Bogoriense for further research.

There is an interesting note in this study, namely the discovery of a species of *D. viridis* currently only recorded as having a distribution in Celebes and Mollucas (Maryanto et al. 2019). This species was observed to be sympatric with *D. peronii*, and both were exclusively recorded in only

one sampling location during this investigation. According to previous publication, *D. peronii* distributed in Bali and Nusa Tenggara (Suyanto 2001). The two species exhibited significant morphological differences in body color and skull length, with the skull length of *D. viridis* being shorter and more robust than that of *D. peronii*. According to Suyanto (2001), the claws of *D. peronii* are ivory yellow, and those of *D. viridis* are green (Figure 2). These two species are simultaneously found in the Camplong Nature Tourism Park, which has a secondary dry land forest habitat. *Dobsonia viridis* is reported to be spread in forest areas, plantations, and roosting in caves or trees (Tsang 2016a). This species is categorized as least concern (IUCN 2024) because it has a stable population and is considered capable of adapting to disturbed habitats (Tsang 2016a).



**Figure 2.** Morphological comparison between *Dobsonia peronii* and *Dobsonia viridis* species in this study. A. *D. Peronii*; B. *D. viridis*; C. *D. peronii*; D. *D. viridis*; E. Dorsal view of skull (*D. viridis* on top); F. Ventral view of skull (*D. viridis* on top)

These two species exhibit discernible differences in claw coloration. The claw's color of *D. viridis* are green, as illustrated in the right image. While the two species could potentially have been mistaken for the same species, their sympatric occurrence fortunately allowed for a direct comparison between them. Based on the skull length, the *D. viridis* found was 43.9 mm and the *D. peronii* 47.9 mm. According to Suyanto (2001), the skull length of *D. viridis* is shorter than *D. peronii*, around 46.5-49 mm, while *D. peronii* is 48.8-51.9 mm. We currently indicate that this finding is a new record. However, if we refer to the skull length, the difference with Suyanto's (2001) notes makes it potentially a new species. Tissue samples from *D. viridis* that we found in this study were deposited at the Museum Zoologicum Bogoriense for further study. The findings of the research will be presented in other publications.

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